PATENT ABSTRACTS OF JAPAN

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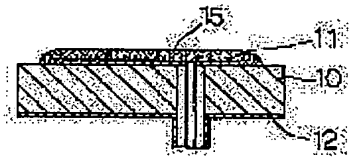
(54) RESONANCE FREQUENCY ADJUSTMENT METHOD FOR MICROSTRIP ANTENNA

(57)Abstract:
PURPOSE: To provide the method in which the resonance frequency adjustment in both directions is attained by easily adjusting the resonance frequency without remodeling an electrode.
CONSTITUTION: A dielectric film 15 is formed on a surface of a radiation electrode 11 and the resonance frequency is adjusted by increasing the effective dielectric constant of a dielectric base 10 or decreasing the effective dielectric constant thereof through the elimination of the dielectric film 15 thereby increasing or decreasing the resonance frequency. When the effective dielectric constant is increased, the resonance frequency is decreased and when the effective dielectric constant is deceased conversely, the resonance frequency is increased.



LEGAL STATUS

[Date of request for examination]

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[Date of final disposal for application]

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CLAIMS

[Claim(s)]
[Claim 1] The resonance frequency adjustment approach of the microstrip antenna characterized by gathering the effective dielectric constant to the dielectric constant of a dielectric substrate, and lowering resonance frequency by this by adding wrap dielectric materials for a radiation electrode in the resonance frequency adjustment approach of the microstrip antenna which equipped the front face of a dielectric substrate with the radiation electrode of 1/2 of the dimensions of wavelength, and equipped the rear face with the earth electrode.
[Claim 2] The resonance frequency adjustment approach of the microstrip antenna characterized by adding wrap dielectric materials for the radiation electrode beforehand, lowering the effective dielectric constant to the dielectric constant of a dielectric substrate by removing a part of the dielectric materials [at least] in the resonance frequency adjustment approach of the microstrip antenna which equipped the front face of a dielectric substrate with the radiation electrode of 1/2 of the dimensions of wavelength, and equipped the rear face with the earth electrode, and raising resonance frequency by this.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention starts the microstrip antenna used for a navigation system etc., and relates to the adjustment approach of the resonance frequency especially.

[0002]
[Description of the Prior Art] In the GPS navigation system etc., the miniaturized antenna which receives the signal from a satellite is needed, and use of a microstrip antenna is considered as the kind.
[0003] It has the radiation electrode of the dimension of 1/2 of wavelength which receives this microstrip antenna on the front face of the substrate of a dielectric, and an earth electrode is formed in a rear face on the whole surface. There are a square shape and a circular thing in a radiation electrode, and broadband-ization of received frequency is attained by devising the configuration.
[0004] Drawing 6 is the transverse-plane sectional view showing an example of the structure of such a conventional microstrip antenna. The radiation electrode 61 is formed in the front face of the dielectric substrate 60, and the earth electrode 62 is formed in the rear face. A conductor lets a through hole pass from the 50-ohm point of a radiation electrode, and it is pulled out by the coaxial track. It is effective dielectric constant epsiloneff which the dimension L is determined by ** formula of several 1, and determines it when based on the electrode of a square shape. It is determined by ** formula. Here, f0 is resonance frequency and epsilonr. The dielectric constant of a dielectric substrate and C express the velocity of light, and h shows the thickness of a dielectric substrate and w shows the width of face of an electrode.
[0005]
[Equation 1]

$$L = \frac{C}{2 f_0 \sqrt{\varepsilon_{eff}}} \qquad ①$$

$$\varepsilon_{eff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2\sqrt{1 + 10h/w}} \qquad ②$$

[0006]
[Problem(s) to be Solved by the Invention] In actually manufacturing a microstrip antenna, frequency regulation is needed and the activity doubled by generally shaving an electrode is done. However, fine tuning of a frequency is difficult and has become the big factor of the increment in a man day.
[0007] This invention offers the possible adjustment approach in the rise of a frequency, and any direction of a fall while enabling it to adjust resonance frequency of a microstrip antenna easily.
[0008]
[Means for Solving the Problem] This invention solves the above-mentioned technical problem adding a dielectric to a radiation electrode surface, and by removing this.
[0009] That is, in the resonance frequency adjustment approach of the microstrip antenna which equipped the front face of a dielectric substrate with the radiation electrode of 1/2 of the dimensions of wavelength, and equipped the rear face with the earth electrode, by adding dielectric materials to a radiation electrode surface, the effective dielectric constant to the dielectric constant of a dielectric substrate is gathered, and it has the description to lower resonance frequency by this.
[0010] Moreover, in the resonance frequency adjustment approach of the microstrip

antenna which equipped the front face of a dielectric substrate with the radiation electrode of 1/2 of the dimensions of wavelength, and equipped the rear face with the earth electrode, dielectric materials are beforehand added to the radiation electrode surface, the effective dielectric constant to the dielectric constant of a dielectric substrate is lowered by removing a part of the dielectric materials [at least], and it has the description to raise resonance frequency by this.

[0011]

[Function] Resonance frequency is adjusted to both directions, without changing the effective dielectric constant (above epsiloneff) of a dielectric substrate, and adding a hand to an electrode by addition or removal of a dielectric.

[0012]

[Example] Drawing 1 is the transverse-plane sectional view showing the example of this invention. The radiation electrode 11 is formed in the front face of the dielectric substrate 10, and an earth electrode 12 is formed in a rear face. In the front face of the radiation electrode 11, spreading formation of the dielectric film 15 which made resin or resin, such as epoxy system resin, distribute dielectric powder is carried out.

[0013] By addition of a dielectric film 15, if the effective dielectric constant of the dielectric substrate 10 increases, the resonance frequency by the electrode of the same dimension will fall from the formula of above **. Therefore, resonance frequency can be doubled by setting up the dimension of a radiation electrode more highly from resonance frequency beforehand, and controlling the amount of addition of a dielectric film 15.

[0014] Drawing 3 shows change of the frequency when applying epoxy system REJISUTO ** of about 28mm angle so that the radiation electrode of about 20mm angle may be covered on 36mm angle and a dielectric substrate front face with a thickness of 6mm. before spreading -- 1585MHz it was -- resonance frequency -- 300 micrometer the time of applying -- about 10MHz It was able to double with the frequency of 1575MHz at the time of a frequency falling and using for (**) and GPS.

[0015] Moreover, when the resin which mixed dielectric powder is applied similarly, it is about 30MHz. Resonance frequency was able to be lowered (**).

[0016] As an ingredient of a dielectric film, although the above-mentioned resin or this was made to distribute dielectric powder, others, glass, or a dielectric paste can be used. These can be applied, it can be made to be able to harden by printing etc., and the stable resonance frequency can be obtained.

[0017] Drawing 2 is the transverse-plane sectional view showing other examples of this invention. Although it is the same as that of the above which formed the radiation electrode 21 and the earth electrode 22 in the dielectric substrate 20, the dielectric film 25 is beforehand formed in the front face of the radiation electrode 21, and the example which deletes this is shown. The dielectric film 25 is applied as the broken line 24 of drawing 2 showed with the same ingredient as the above-mentioned example, deletes this after that and makes thickness thin.

[0018] By removal of a dielectric film 25, if the effective dielectric constant of the dielectric substrate 20 falls, the resonance frequency by the electrode of the same dimension will rise from the formula of above **. Therefore, resonance frequency can be doubled by applying so that the amount of a dielectric film may be beforehand set up lowness from resonance frequency, and controlling the amount of deletion of a dielectric film 25.

[0019] the resin in which drawing 4 mixed dielectric powder -- beforehand -- 300 micrometers applying -- a surface grinder -- 50 micrometers every -- change of the frequency when deleting gradually is shown. the beginning and 1557MHz it was -- resonance frequency goes up gradually -- 150 micrometer When it deleted, about 10MHz resonance frequency was able to rise, and it was able to be made mostly in agreement with desired value.
[0020] As mentioned above, according to this invention, adjustment of about **3MHz is attained. For example, C/A code of GPS Although it is a 1575.42**1MHz signal, the band of this antenna is VSWR= 1.5, and it is about 10MHz. It has width of face, and if adjustment of about **3MHz can be performed, it is fully utilizable.
[0021] In addition, even if the effectiveness by addition of a dielectric forms a dielectric 55 so that the perimeter of the radiation electrode 51 may be covered as shown in drawing 5 since it receives the leakage of the electromagnetic field from a radiation electrode end face, the same effectiveness has it.
[0022]
[Effect of the Invention] According to this invention, resonance frequency can be adjusted easily, without adding a hand to an electrode. And since an electrode is not shaved, fine tuning and readjustment also become easy and not only reduction of a man day but the improvement in the yield of them is attained.
[0023] Moreover, adjustment becomes possible at both the direction to raise and the direction to lower, and dealing with dispersion in the property of a component also becomes easy.

TECHNICAL FIELD

[Industrial Application] This invention starts the microstrip antenna used for a navigation system etc., and relates to the adjustment approach of the resonance frequency especially.
[0002]

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] In the GPS navigation system etc., the miniaturized antenna which receives the signal from a satellite is needed, and use of a microstrip antenna is considered as the kind.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In actually manufacturing a microstrip antenna, frequency regulation is needed and the activity doubled by generally shaving an electrode is done. However, fine tuning of a frequency is difficult and has become the big factor of the increment in a man day.
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MEANS

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OPERATION

[Function] Resonance frequency is adjusted to both directions, without changing the effective dielectric constant (above epsiloneff) of a dielectric substrate, and adding a hand to an electrode by addition or removal of a dielectric.

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EXAMPLE

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The transverse-plane sectional view showing the example of this invention

[Drawing 2] The transverse-plane sectional view showing other examples of this invention

[Drawing 3] The explanatory view of change of the resonance frequency by this invention

[Drawing 4] The explanatory view of change of the resonance frequency by this invention

[Drawing 5] The top view showing other examples of this invention

[Drawing 6] The transverse-plane sectional view showing the conventional example

[Description of Notations]

10, 20, 50: Dielectric substrate

11, 21, 51: Radiation electrode

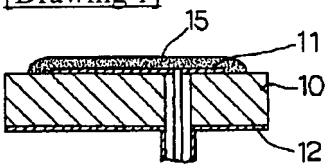
12 22 : Earth electrode

15, 25, 55: Dielectric film

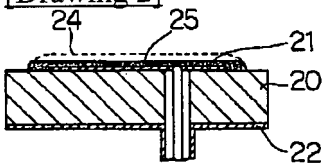
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



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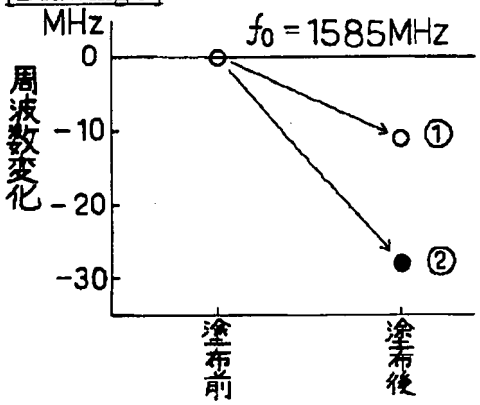

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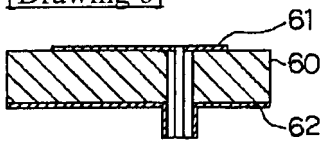

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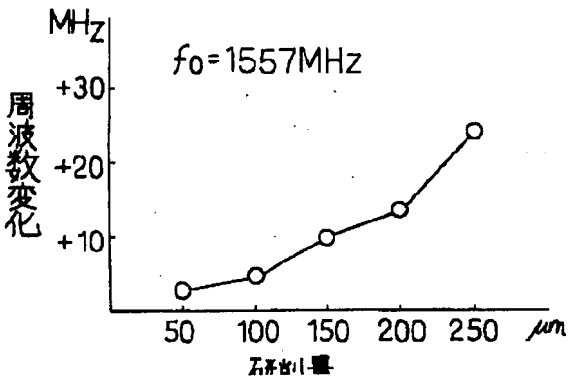
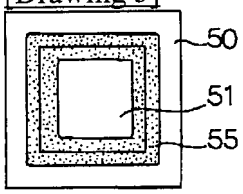


[Drawing 5]



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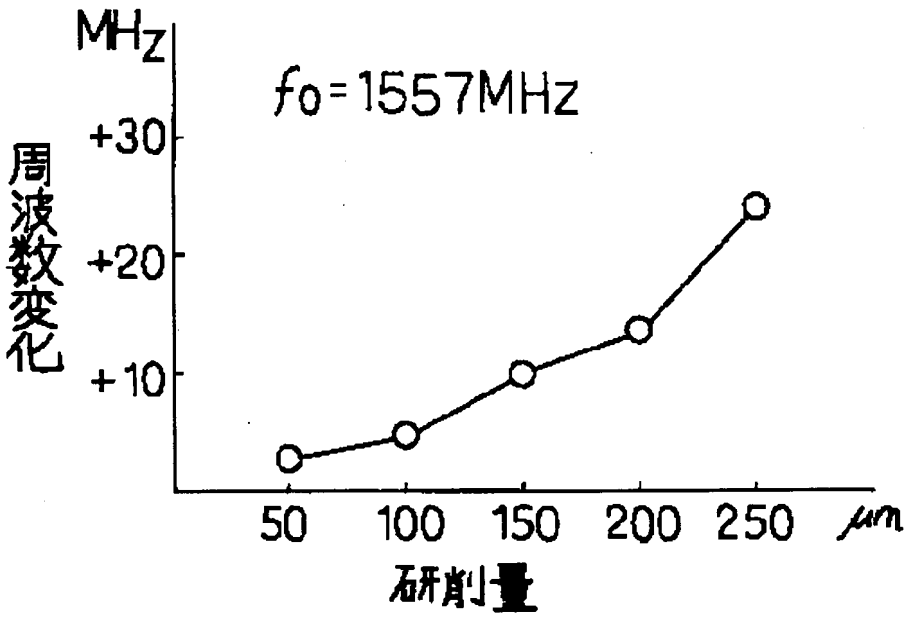
WRITTEN AMENDMENT

---------- [a procedure revision]
[Filing Date] June 12, Heisei 4
[Procedure amendment 1]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 4
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 4]



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